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out as just mentioned, it is laid in the angle n , fig. 14, below the pile-threads, and above all the warp. The treadles being now put in action, the alternate threads of the warp are raised and the shuttle is thrown, passing under the raised threads and over the other threads of the warp as well as the pile-threads; the stroke of the beam then brings the last-thrown shoot-thread in contact with the preceding, and thus forms a loop of the pile-thread over the last-inserted wire. If the tension of the pile-threads is not equal, and is less than it ought to be, they will stick more or less to the warp, as shewn at a , fig. 16; and much time is lost in freeing them before the next wire can be laid in.

No. II.

CARDS FOR SILK-WEAVERS.

The SILVER ISIS MEDAL and FIFTEEN POUNDS were presented to Mr. J. HUGHES, Sebright Street, Bethnal Green, for his improved Cards for weaving Figured Silks.

THIS improvement consists in making the bands or set of card-slips aa , figs. 1 and 7, contain two patterns instead of one; but these cards, with the square-revolving bar b , on which they are used, being a great improvement on the draw-boy which they have superseded, it will be requisite to describe the apparatus by which they determine what

lashes shall or shall not be raised. It will be sufficient to begin with the lifting-hooks *cc*, figs. 1 and 2, which raise the lashes, because, in Vol. XL. of the Transactions, the Society has published a complete silk-weaver's loom and draw-boy, considered the best at that period, and from which the remaining particulars may be learnt. These lifting-hooks *cc* pass perpendicularly through eyes in as many horizontal needles *de*, which lie in the frame *ff*. These needles have a limited end motion, and are kept protruded through the frame *f* at *d* by as many helical springs *gg* pushing against their other end; and that the hooks *cc* may slide up and down freely through the eyes, these latter are kept in the best position for this purpose, their end motion being limited by having loops formed in their ends *e*, through which the vertical pin *hh* is passed to limit their motion, and close to which horizontal wires pass, on and between which the loops *e* slide, and are therefore kept flat. Fig. 3 is a needle separate; *e* the loop; *h* the vertical pin; *i*, part of one horizontal wire; *j*, the eye through which one of the hooks *c* passes. Only eight lifting-hooks *c*, and their eight needles *de*, are shewn, but the frame *f* contains 50 sets, or 400 needles, exactly in a line behind these. Above is a frame *k*, having eight lifting-bars *ll*, over which the upper bends of the lifting-hooks stand, 50 to each bar; the frame *k*, with its bars *ll*, is raised by a lever connected by string to a treadle, and, if raised when the hooks stand as in fig. 1, the whole 400 lashes would be raised; but if part of the needles are pushed in as *dddd*, the alternate ones in fig. 2, they push their respective hooks *cccc* out of the way of the bars *ll*, which may then rise without them, lifting only those whose needles are not thrust in. Now, the determination

what hooks are to be raised or left down, in order to produce figured work, is produced by the varying and alternating perforations in the cards *aa*, each slip of which is in succession brought against the frame *f* by the revolving bar *b*, on which they are hung; thus all the hooks and lashes are raised whose needles meet with perforations in the cards, and all those are left down whose needles meet with blanks which thrust them in. The bar *b* is mounted by its end pivots *m* in a frame *n*, which is jointed above so as to swing from and to the side of the frame *f* with no variation. Fig. 4 shews this bar separate; it has at one end four pillars, *o*, *p*, *q*, and *r*, on two of which the hook *s*, fig. 1, lies; and when the frame *n* is swung to the left, as in fig. 1, it carries with it the bar *b* from its place against the frame *f*, shewn by dotted lines; but the hook *s* always catches hold of the upper and outer pillar, and retains it, therefore the bar is obliged to turn one quarter round every time it is carried out; and that this turn may be exact, a J-shaped bar, *ttu*, is kept pressed down on the two upper pillars by a spring, the bar *u* sliding in the frame *nn*; thus the slips 1, 2, 3, &c. are brought in succession opposite to, and are pressed against, the frame *f*, where the needles *d* project. It is immaterial on which side of the revolving-bar any slip of the band is hung, because it is full of holes on each side alike, in this instance eight rows of 50; so that, if brought alone to the needles *d*, the whole 400 would enter the holes without being touched, as they are made perfectly to correspond. In order, therefore, to produce the alternations, the patterns on the slips were made by perforations over four alternate rows, as in fig. 5, and the intermediate blanks thrust in the needles; the next slip in

succession contained the perforations over those rows that were blank in the first card, and so on alternating: here it is evident that the cards required the blank spaces to thrust in alternately the different rows of needles. Now, Mr. Hughes's improvement consists in not requiring the blank spaces; therefore, in his cards, the intermediate spaces are used for another pattern, whereby the whole expense, except that of punching, is saved in every second pattern. The band *aa*, part of which is here shewn, contains 156 slips, and all these have to be well joined by strings *vvv*, figs. 6 and 7, through holes punched for them: all this has been saved by putting on a second pattern. To make use of these double-pattern cards, the square bar *b* is covered by four cards *ww*, which are tied on with thread at *xxx*; these four cards are a substitute for all alternating blank spaces; they have but four rows of holes, and hide four in the bar. The lowest card *ww*, in fig. 4, blanks the 1st, 3d, 5th, and 7th row of holes, while the upper card blanks the 2d, 4th, 6th, and 8th rows, thus alternating round the bar. Therefore, to use one pattern, say the lowest, it is hung on the side *y*, fig. 6, where it will be seen the under card *w* blanks the upper pattern; but if the same slip is hung on the next side *z*, as in fig. 7, it will blank the lower pattern and shew the upper one; (part of these cards *aa* is torn away, to shew the under or substitute cards *ww*.) That the revolving band may be obliged to travel as the bar *b* turns, and that the slips may fit accurately to the same place, they have larger holes *a'a'*, which fit on the pegs *b'b'* of the bar. When the frame *k*, fig. 1, is raised, the roller *c'* attached to it rolls up the bent iron strap *d'* of the frame *n*, and pushes it out. When the hook *s* causes a quarter

turn, and when the frame *k*, with its roller, descends, the roller *c'* acts against the turned up end *e'* of the iron strap *d'*, and compels the revolving-bar *b* to come quite close to the frame *f*, and push in the proper needles. *f'g'* is a string to lift the upper hook *s* and bring the lower one into action, so as to cause a return of the bar if needed.